

CARTOGRAPHIC VISUALISATION AND LANDSCAPE MODELING

Milap Punia

Associate Professor, Centre for the Study of Regional Development, School of Social Sciences, Jawaharlal Nehru University, New Delhi-110067 - punia@mail.jnu.ac.in

KEY WORDS: Preception, Aesthetics, Cartographic Design, Visualisation, Landscape

ABSTRACT:

Perception plays a major role for interpretation or extracting information from remote sensing data and from thematic maps. With advances in information technology, there remains a necessary and critical role for the “human in the loop” in the interpretation of remotely sensed imagery, in earth sciences and cartography. On the side of information technology display systems play a critical role in supporting visualization, and in recent years it has become widely recognized that the visualization of data is critical in science, including the domain of cartography, a field with a long-standing interest in issues of communication effectiveness. These cartographic concerns pertaining to the features of display symbols, elements, and patterns have clear effects on process of perception and visual search. In this study an attempt has been made to harness, interpret, compare and evaluate landscape aesthetics with cartographic aesthetics. By understanding and incorporating cartographic aesthetics with landscape aesthetics, the cartographic design process can be strengthened and effective maps can be generated. Here both landscape and cartography are considered as objects of aesthetics and an attempt has been made to evaluate their aesthetic experience and to analyze their various patterns of similarity and exceptions. By doing this it formulates and facilitates conception of feeling, expression and visual reality all together in the cartographic design process.

1. INTRODUCTION

Visualisation has always been the focus of the cartographers ‘to make things visible’ from this perspective, cartography has always been about visualisation. Similarly, cartographic visualisation has been described as a mental process facilitated by maps (*MacEachren and Garter, 1990*), as primarily a kind of map use (*DiBase, 1990; MacEachren et al., 1992*), as map display technology (*Makkonen and Sainio, 1991; Taylor, 1991; Dorling, 1992; Monmonier, 1992*) dealing with representation of geographic space and time. Now-a-days tourism is a competitive industry. By definition, tourism involves travel to a place where the tourist normally does not work or live (*Richmond, 2003*). A traveller, therefore, has limited spatial knowledge of the visited environment, and maps perform an essential function in the acquisition of spatial information about the travel destination. Attracting a share of travel business is dependent to great degree upon a comprehensive marketing strategy and in that display and visualization of tourist related information plays a major role. For highlighting the attractiveness of the tourism destinations, *Maps* play a significant role in how we discover, learn, and communicate information about the places around us. Maps are indispensable vehicles for the communicating spatial information and creating images of the space and the place.

The term aesthetics derives from the Greek word, which means perception. The derivatives modern meaning of beauty, taste, and artistic criteria arose in the 18th century. The modern word perception is subjective rather than objective; perception refers to the perceiver rather than object. Aesthetics turn graphs into graphics so that they are perceivable, but they are not perception themselves (*Wilkinson, 1999*). Similarly, Beauty has thus been regarded by philosophers as one of the three ultimate values.

Aesthetics has been a subject of philosophy since long period. Up to the 18th century the focus of inquiry was beauty but following the invention of the term aesthetics by the German philosopher, Alexander Baumgarten in about 1750, philosophy broadened its inquiry to encompass this more inclusive term (*Lothian, 2002*). Philosophers distinguish between the aesthetic object, the aesthetic recipient and the aesthetic experience. The aesthetic object is that which stimulates an experience in the recipient refer Fig 1. Landscape is one of many aesthetic objects which philosophy has considered. And similarly the maps are abstract representations of the landscape. Regarding human interaction with aesthetic objects, whether music, art, sculpture, human faces, architecture, poetry, or landscapes, philosophers have sought to identify the common principles, which operate, and which determine the nature of the aesthetic experience.

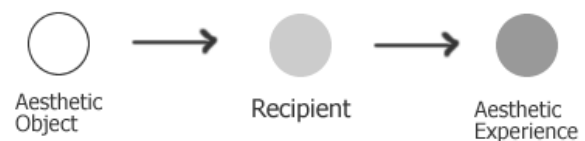


Figure 1. Aesthetic Object to Experience

If works of art were regarded as possessing aesthetic properties, then it would seem that such properties should be capable of definition, or at least approximate description. The term ‘aesthetic is strictly defined as pertaining to “things perceptible by the senses’ (Shorter Oxford English Dictionary), and therefore is

associated with what we normally regard as feeling, and the condition of being emotionally affected. In this respect, also, it is an important aspect of rhetoric, which treats what can be emotionally affective as necessary component of communication (Keates, 1996).

The term landscape clearly focuses upon the visual properties or characteristics of the environment, these include natural and man-made elements and physical and biological resources which could be identified visually; thus non-visual biological functions, cultural/historical values, wildlife and endangered species, wilderness value, opportunities for recreation activities and a large array of tastes, smells and feelings are not included (Amir and Gidalizon, 1990). Similarly, kind of landscape plays an important role in attracting tourist in many regions. They provide evidence of importance which landscape have in our culture, so landscape is assumed to be a quality present in the scene, a quality which one visits to see, experience and enjoy. An assessment or evaluation of the landscape aesthetics will give more understanding of the touristic content and can help a sensible cartographer to sense the pulse of potential user's requirements in the form of preferences (Keates, 1996). For highlighting tourist destination and its image formation data visualization plays an important role in communicating information (Kraak et al., 2002) thus cartographic design process can be made effective by incorporating landscape aesthetics. For doing that landscape aesthetics is harnessed and its visual percepts are compared with cartographic aesthetics and are incorporated in cartographic design process for making effective and realistic landscape maps.

2. METHODOLOGY AND PROCEDURE

For visualization of tourist landscape information as destination attraction, aesthetics of landscape is harnessed, interpreted, compared and evaluated with cartographic aesthetics. By understanding and incorporating cartographic aesthetics with landscape aesthetics, the cartographic design process can be strengthened and effective tourist webmaps can be generated. In this study both landscape and cartography are considered as objects of aesthetics and an attempt has been made to evaluate their aesthetic experience and to interpret, analyze their various patterns of similarity and exceptions. By doing this it formulates and facilitates conception of feeling, expression and visual reality all together in the cartographic design process. In Figure 2, detailed design workflow for generating tourist landscape information is depicted. The spatial datasets needed is compiled, processed, classified and generalized in ArcGIS environment for touristic purposes at 1: 5 million scale. After that data is enhanced cartographically by designing symbols for point and line features using Freehand and Fireworks Macromedia software. Simultaneously, the subjective nature of aesthetics is evaluated through questionnaire and its analysis is incorporated in cartographic design process namely colour and expression. Both landscape and cartography are considered as objects of aesthetics and some patterns of similarities and exception are analysed through the questionnaire that was floated online in between the study. Finally an attempt has been made to use some of similarities that are common in representation of landscape and the maps in the cartographic design process for generating effective maps.

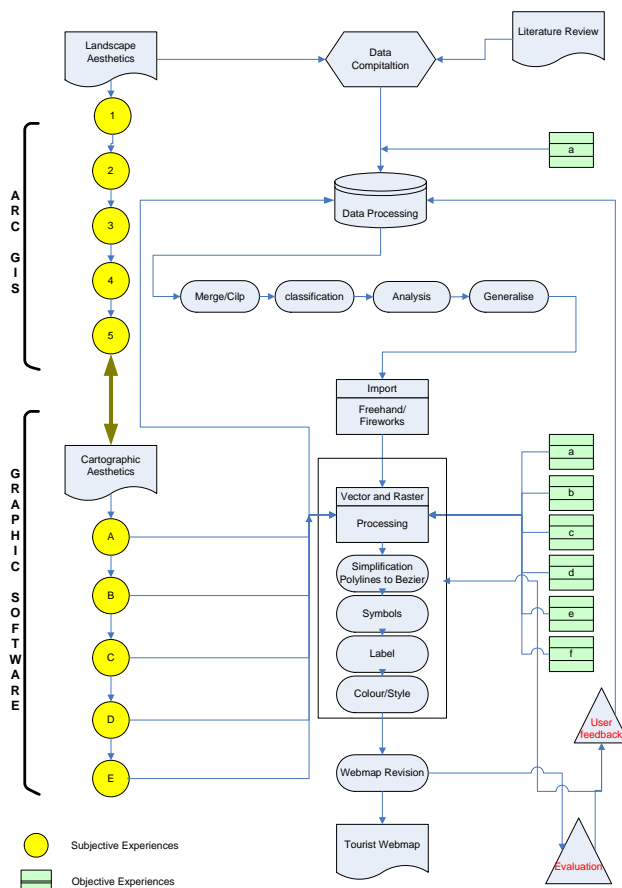


Figure 2.

3. AESTHETICS AND CARTOGRAPHY

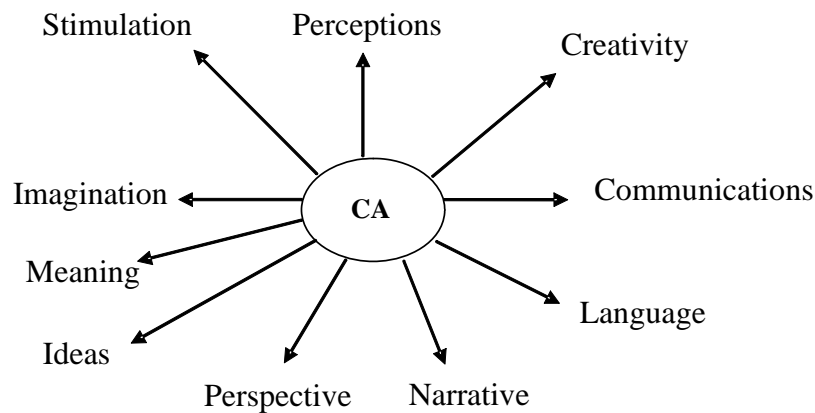
Several decades ago, the map critic John K. Wright addressed this issue; the quality of a map is also in part an aesthetic matter. Maps should have harmony within themselves. An ugly map, with crude colors, careless line work, and disagreement, poorly arranged lettering may be intrinsically as accurate as a beautiful map, but it is less likely to inspire confidence. (Wright cited in Keates, 1996). The 'art of cartography' works in tandem with rules, guidelines, and the elements of 'cartographic science' which are much more tangible (objective in nature) (Krygier, 2004). Later on three elements have been defined as forming the basis for the evaluating of map aesthetics: harmony, composition and clarity (Karrsen, 1980). Wright (1942) explained that maps were necessarily are reflection of both objective reality and the subjective landscape of the cartographer. In proposing an aesthetic theory of art (Eldridge cited in Keates, 1996) states that 'The aesthetic quality possession of which is necessary and sufficient for thing's being art is the satisfying appropriateness to one another of a thing's form and content'.

He regards this as the minimum definition, allowing room for new contents and new forms. He argues that therefore 'the theory of art is both affiliated with psychology and not reducible to empirically laboratory psychology' this is because a work of art engages the sensibility, which is quite different to acting predictably upon a passive receiver.

4. DESIGN AND AESTHETICS

Design uses the aesthetics for making maps functional and expressive. In cartography, design leads to functional product that's the map like in other fields of arts, as in architecture, painting. Where as design and aesthetics go together in various processes and the intent of the product, but differ in method and

general applicability. Take an example of the design of a thematic map. A map is a result of data analysis, literature review; the identification of defined goal, synthesis and integration of skills or techniques for the representation of data. So these processes guide the creation of a map through detailed design and construction or skills. However most of the general principals of design do not apply to cartography because of the geographical constraints that pertain. In cartography we can not swap the various elements around in order to make it more readable (Collinson, 1997). Where as, aesthetics focuses on the beauty of the map in subjective as well as objective sense. It goes with design process as an artistic sense of knowing, expressing and engaging emotions in the map refer Fig 3.

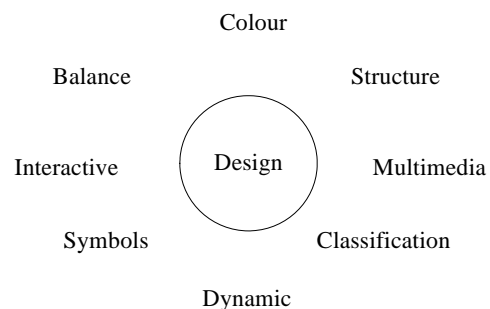


(After Trifonoff, 1999 and Cognitive Science, 1999)

Figure 3. Cartographic Aesthetics

The objectivity is generally about the inherent characteristics of the landscape i.e. line, point and aerial features and the techniques to represent them qualitatively or quantitatively. For representing them various skills are utilized which are all objective in nature as they are concerned with the inherent nature of object i.e. Colour theory, generalization directives, graphic semiology, typographic rules, conventions etc.

Design uses aesthetics but the principles of aesthetics are not those of design refer Fig 4. We are not just prettying maps up. The philosophy is simple; beauty (aesthetics) focuses the attention. Focusing the attention is the purpose of map design! (Collinson, 1998)



(After Alan Collinson, 1998)

Figure 4. Design

5. DESIGN OF TOURIST LANDSCAPE INFORMATION

The design part of cartographic tourist landscape information consists of many processes that all together finally convey the information in the form of effective tourist map. So for making

effective maps the cartographic design process can be better controlled using landscape aesthetics and user preferences. Inculcating the aesthetics experiences of the landscape can control the map design. By doing this various process of designing can be better interpreted and thought of well in advance and thus later controlled in cartographic design.

There are generally two broad methods that lead to flow of information and finally represent the landscape in the form of maps (Kraak and Brown, 2001).

1. Data preparation and compilation
2. Cartographic representation

Data preparation designates the content and form of the map, so therefore content and design have to be thought about together. And there should be some kind of imagination, some idea of what the final appearance will be, and in this sense manipulates both the content and the expression towards the objective. The objective is to visualize some thing in the form of map for that information, composition, representation and design can be seen as united as one system on which different external forces exert influence.

So for information gathering, the landscape aesthetics can be grasped in objective sense as well as subjective sense. Both paradigms should be considered, as objective paradigm will guide the extraction of the inherent characteristics of landscape-both cultural as well as natural while subjective paradigm will generate the valuable information that are preferred by the tourist or to whom tourist is generally attracted. In data preparation, these things can be considered and accordingly data can be gathered, compiled, classified and evaluated.

Landscape as an aesthetic object from the view of subjective preferences that can highlight various perspectives towards landscape. They can be objective, which guides and facilitates data compilation by photogram- metric and survey techniques, thus beauty can be defined aesthetically on the map as real representation of the landscape as the ratio of the proportions of line, colour or tone. Various authors have shared their views for defining beauty in the landscape:

1. Expression (Langer, 1957)
2. Emotions (Collinson, 1997)
3. Feelings
4. Pleasure (Collinson, 1997)
5. Creativity and Imagination (Kneller, 1965)

As a matter of fact that the objectivity of the landscape can be depicted by its inherent characteristics but finally it's perceived by the user's whose domain is very large and quite variant and thus it was concluded that beauty lies in the eyes of beholder and every user interprets in his own way. But a user group can be studied and their preferences can be implied while designing the tourist product. Beauty can be defined as the ratio of the proportions of the line, colour or tone and thus is an objective principle. Indeed, the very fact that this ratio or mathematical structure of nature cannot be understood by the senses but by the mind reiterates the theory that beauty is an objective principle. There is a difference between the perceived line or colour and beauty. A red or blue, a thick or thin line is perceived by senses,

they are not beautiful as such, although they may charm or stimulate the eye. But the aesthetic ratio is hidden for the sense; it is only in a mutual relationship between colour, line and tone that the ratio appears. A full understanding of the perception of beauty requires not only talent but also training. Consequently, beauty does not manifest itself equally for everyone (Karssen, 1980).

The graphic image, as proportions in line, colour or form, reveals three main elements of aesthetic ratios:

1. Harmony, (Wright, 1942)
2. Composition and (Dent, 1996)
3. Clarity (Karssen, 1980)

These three elements serve as a guide to beauty determination. Harmony is the ratio between the different elements and those elements, which are related to each other. Composition is the element, which accounts for the arrangements of accents. It can also reveal the emphasis or weakness of the different elements. Composition also reflects the accents of contrast. Clarity is the means of recognition and the simple identification of graphic elements. A map, which lacks one or more of these three elements, lacks beauty. Beauty therefore, is not put into map but merely added to it. Of course, it is worthwhile noting that subjectivity design can result in objective beauty (McLuhan et al., 1967).

Although the cartographer is restricted in his freedom, the graphic image or map is still a subjective product. The subjective elements whereby a cartographer is able to show artistic talents can be analyzed under five segments A, B, C, D, and E as shown in the Figure 5. These five phases together form the total appearance. The portion which remains objective information, like place determination, attribute data, etc. The cartographer cannot check the objectivity but it's the work of the geodesist, photogrammetrist, and geographers. Nevertheless, the cartographer does a purely objective role when he takes over the information presented and examined by others.

In the Figure given a, b, c, d and e are the rules of the cartographic design, which can be acquired by the training or practice and they are very essential for a good cartographer. The rules of cartographic design are concerned with representation of features objectivity like point, line, area location, graphic semiology, colour theory, visual psychology, typographic rules and conventions etc.

For generating tourist landscape information webmaps, the proposed design has been used and apart from the content of the map, main emphasis is given to the expression of the touristic attractions of the region refer Figure 6 . For better expression, the new symbols are created for the places where there are forts, palaces or some building of cultural significance but they too are also generalised.

6. CONCLUSION

The landscape concept is looked from various aspects viz., land, as we perceive, as constituent of various land features, as a visible landscape and as an object of aesthetics. The visual and aesthetic qualities, which are resultant stimuli from aggregation of physical attributes and human influences and which define the experiences

of a place and forms an image of destination. The visual impression of the landscape is synthesised as information and converts that into a landscape image. This landscape image is described in qualitative terms of beauty, harmony, contrast and

variety. The perception of the ideal landscape is determined by aesthetic standards and may vary from one human group to the other or from one human group through time

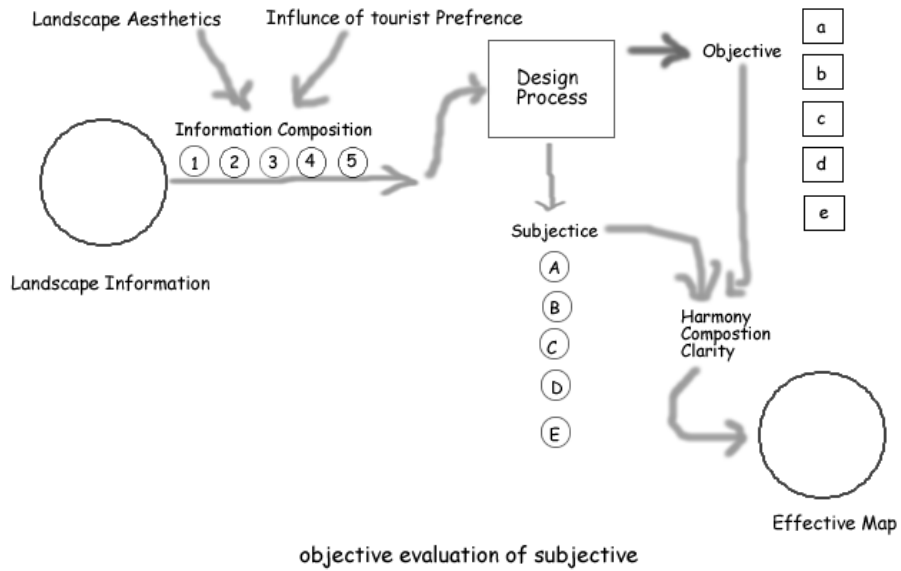


Figure 5. Design for Tourist landscape Information

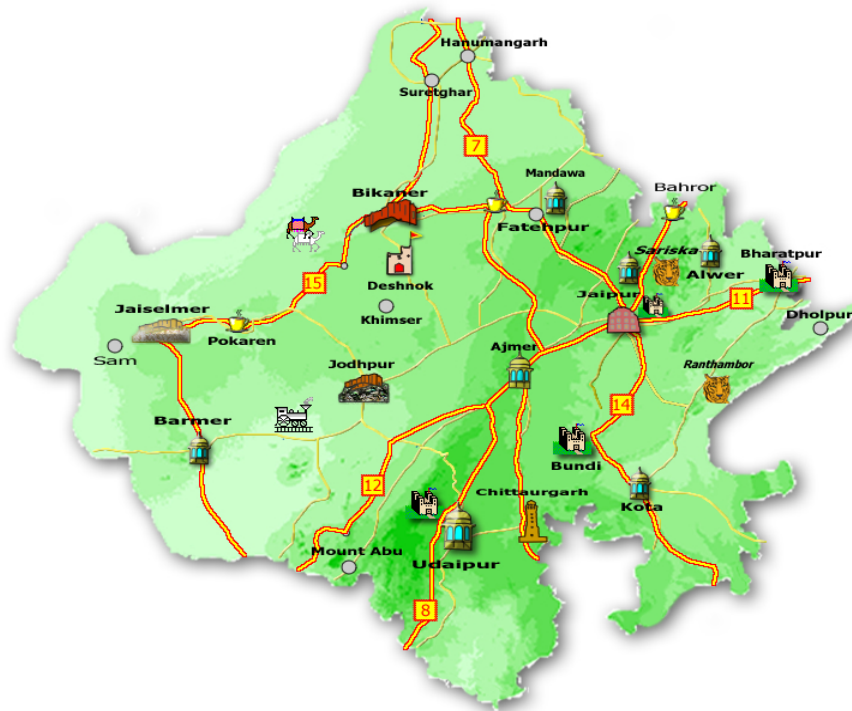


Figure 6. Tourist Landscape Information

REFERENCES

- Amir, S. and Gidalizon, E. (1990). Expert based Method for the Evaluation of Visual Absorption Capacity of the Landscape. *Journal of Environmental Management*. 30: 251-263.
- Cognitive Science (1999). <http://www.hfac.uh.edu/cogsci/keytopics.html> (Accessed on 8 July, 2004).
- Collinson, A. (1997). Virtual Worlds. *The Cartographic Journal*. 34(2): 117-124.
- Collinson, A. (1998) British Cartographic Society Design Group, WWW page http://acl.arts.usyd.edu.au/VISTA/20maps&projections/cartographic_design.htm (Accessed on 28 July, 2004).
- DiBase, D. (1990). Visualisation in Earth Sciences. Earth and Mineral Sciences, Bulletin of the College of Earth and Mineral Sciences, Pennsylvania Sate University. 59(2): 13-18.
- Dorling, D. (1992). Visualising people in time and space. *Environment and Planning: Planning and Design*. 19: 613-637.
- Imhof, I. (1957). Art in Cartography. International Year Book of Cartography.
- Karszen, A.J. (1980). The Artistic Elements in Design. *The Cartographic Journal*. 17: 124-127.
- Keates S.J. (1996). Understanding Maps (2nd edn), Addison Wesley Longman, Harlow.
- Kraak, M.J. & Brown, A. (2001). Web Cartography. Taylor & Francis, New York.
- Kraak, M.J and Ormeling, F. (2002). Cartography, Visualization of Spatial Data. Harrow: Longman.
- Krygier, (2004). http://go.owu.edu/~jbkrygie/krygier_html/geog_353/geog_353_lo/geog_353_lo03.html (Accessed on 10 August, 2004).
- Lothian, A. (1999). Landscape and the philosophy of aesthetics: is landscape quality inherent in the landscape or in the eye of the beholder? *Landscape and Urban Planning*. 44:177-198.
- MacEachren, A.M., and Ganter, J.H.(1990) . A pattern identification approach to cartographic visualization. *Cartographica*. 27(2): 64-81.
- MacEachren, A.M., and Mistrick, A.J. (1992). The role of brightness differences in figure ground: Is darker figure? *The Cartographic Journal*. 29 (2): 91-100.
- Makkonen, K., and Sainio, R. (1991). Computer assisted cartography communication. Proceedings 15th Conference of the International Cartographic Association, September 23- October 1, Bournemouth, UK, pp. 211-222.
- McLuhan, M., and Fiore, Q. (1967). The Medium is the Message. New York.
- Monmonier, M. (1992). Authoring graphic scripts: Experiences and principles, *Cartography and Geographic Information System*. 19 (4): 247-260.
- Richmond, R. E., Keller, C.P. (2003). Maps and Internet, chapter-5, Elsevier Science.
- Swann, C. (1969). Techniques of Typography. Lund Humphries, London.
- Taylor, D.R.F. (1991). Geographic Information System: the microcomputer and modern cartography. Oxford, UK: Elsevier.
- Trifonoff, K.M. (1999). Creativity, Art and Cartography in Geographic Education. *Cartographic Perspectives*. 33: 49-59.
- Wilkinson, L. (1999). Statistics and Computing -The Grammar of Graphics. Springer. pp 99.
- Wright, J.K. (1942). Map makers are human: Comments on the subjective in maps. *Geographical Review*. 32: 527-44.